RC and Masonry Structures - BMEEOHSAS42

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

RC AND MASONRY STRUCTURES

1.2 Azonosító (tantárgykód)

BMEEOHSAS42

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	2
Gyakorlat	1

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Félévközi érdemjegy

1.6 Kreditszám

4

1.7 Tárgyfelelős

név	Dr. Koris Kálmán
beosztás	Egyetemi docens
email	koris.kalman@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Hidak és Szerkezetek Tanszék

1.9 A tantárgy weblapja

https://epito.bme.hu/BMEEOHSAS42
https://edu.epito.bme.hu/course/view.php?id=1376

1.10 Az oktatás nyelve

magyar és angol

1.11 Tantárgy típusa

Kötelező az építőmérnöki (BSc) szakon

1.12 Előkövetelmények

Strong prerequisites:

- Reinforced Concrete Structures (BMEEOHSAT43)

Weak prerequisites:

- Building Construction I. (BMEEOEMAS42)

1.13 Tantárgyleírás érvényessége

2024. szeptember 1.

RC and Masonry Structures - BMEEOHSAS42

2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The aim of the course to let the students master the principles, design methods and the typical structural design of different reinforced concrete and masonry structures. Within the scope of the subject, frame and slab structures, bracing systems of reinforced concrete buildings, various reinforced concrete structural details (beam end, corbel, frame corner, curved axis beam, stairs, force transfer, expansion joints, etc.), as well as load-bearing non-reinforced and reinforced masonry walls are discussed. The course provides students with an overview of IT solutions and digital technologies used in the design of reinforced concrete and masonry structures. By completing the course, students will develop digital skills that will contribute to the effective performance of tasks related to reinforced concrete frame structures, bracing systems, slabs and detailing, as well as masonry structures. Students will be provided with and use digital skills (e.g. Autocad, Nemetschek, Tekla, Mathcad, AxisVM, ChatGPT) to perform the engineering tasks in the course. The digital teaching methodology used in the course will effectively support students' skill development and mastery of the outcome requirements.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. Knows the modelling possibilities of reinforced concrete frames, the approximate and accurate calculation methods of internal forces, and the effects to be taken into account in the calculation,
2. knows the approximate stability checking methods of buildings, the possible configurations of bracing systems, the principle of calculating statically determinate bracing systems, and the principles of column and wall design and reinforcing,
3. knows the typical internal forces and their distribution in RC slabs, the available approximate methods for the calculation of internal forces in case of different slab and load types, the internal force distribution around openings, as well as the principles of punching shear analysis in case of flat slabs and the design of RC slabs,
4. knows the basic principles of plasticity theory, and the theoretical principles of plastic slab design,
5. knows the configuration, force distribution and material properties of non-reinforced and reinforced masonry walls, as well as the dimensioning principles of non-reinforced masonry walls,
6. knows the internal force distribution and the design principles of RC beam ends, force introduction zones, corbels and columns with helical reinforcement.

B. Képesség

1. The student is able to approximately and exactly determine the internal forces and deformations of RC frames, to approximately verify the stability of frames, and to determine the necessary reinforcement of RC columns and walls,
2. the student is able to determine the forces acting to walls of a statically determinate bracing system,
3. the student is able to approximately and exactly determine the internal forces and deformations of different RC slabs, to determine the necessary reinforcement of slabs and to verify the punching shear resistance of flat slabs,
4. the student is able to determine the plastic load bearing capacity (collapse load) of simple slabs,
5. the student is able to verify the load bearing capacity of non-reinforced masonry walls subjected to eccentric compression or shear,
6. the student is able to determine the forces acting to walls of a statically indeterminate bracing system.

C. Attitűd

1. The student cooperates with the lecturer,
2. the student is open to the use of IT tools,
3. the student makes an effort to get to know and use the tools needed for the dimensioning of RC frame and plate structures, as well as masonry walls,
4. the student makes an effort to accurate and error-free task solving,
5. the student seeks to enforce the principle of energy efficiency and environmental awareness in the design of reinforced concrete and masonry structures.

D. Önállóság és felelősség

1. Independently performs the task of thinking and solving tasks and problems related to the dimensioning of RC and masonry structures,
2. welcomes the well-founded critical remarks,
3. uses the systemic approach in its thinking.

2.3 Oktatási módszertan

Presentations, exercise classes, written and oral communication, use of IT tools and techniques, independent task solving, work organization techniques, active consultations.

2.4 Részletes tárgyprogram

Week	**Topics of lectures and/or exercise classes**
1.	Configuration and modelling of RC frames, approximate and exact methods for the calculation of internal forces. Approximate consideration of imperfections and second order effects in case of frames. Bracing of buildings, calculation of statically determine bracing systems, determination of forces acting to the walls. Stability verification of frames. Design and reinforcement of RC columns and walls - 1.
2.	Configuration and modelling of RC frames, approximate and exact methods for the calculation of internal forces. Approximate consideration of imperfections and second order effects in case of frames. Bracing of buildings, calculation of statically determine bracing systems, determination of forces acting to the walls. Stability verification of frames. Design and reinforcement of RC columns and walls - 2.
3.	Configuration and modelling of RC frames, approximate and exact methods for the calculation of internal forces. Approximate consideration of imperfections and second order effects in case of frames. Bracing of buildings, calculation of statically determine bracing systems, determination of forces acting to the walls. Stability verification of frames. Design and reinforcement of RC columns and walls - 3.
4.	Load bearing and typical internal forces of RC slabs. Approximate slab calculation methods (strip method, Menyhárd method, calculation of flat slabs using the method of equivalent beams, continuous slabs systems). FEM calculation of internal forces and deformations of RC slabs. Calculation of slabs loaded by concentrated forces. Force distribution around openings. Punching of flat slabs. Calculation of stairs. The basics of plasticity theory, calculation of collapse load in case of slabs. Reinforcement of concrete slabs, reinforcement drawing - 1.
5.	Load bearing and typical internal forces of RC slabs. Approximate slab calculation methods (strip method, Menyhárd method, calculation of flat slabs using the method of equivalent beams, continuous slabs systems). FEM calculation of internal forces and deformations of RC slabs. Calculation of slabs loaded by concentrated forces. Force distribution around openings. Punching of

	flat slabs. Calculation of stairs. The basics of plasticity theory, calculation of collapse load in case of slabs. Reinforcement of concrete slabs, reinforcement drawing - 2.
6.	Load bearing and typical internal forces of RC slabs. Approximate slab calculation methods (strip method, Menyhárd method, calculation of flat slabs using the method of equivalent beams, continuous slabs systems). FEM calculation of internal forces and deformations of RC slabs. Calculation of slabs loaded by concentrated forces. Force distribution around openings. Punching of flat slabs. Calculation of stairs. The basics of plasticity theory, calculation of collapse load in case of slabs. Reinforcement of concrete slabs, reinforcement drawing - 3.
7.	Load bearing and typical internal forces of RC slabs. Approximate slab calculation methods (strip method, Menyhárd method, calculation of flat slabs using the method of equivalent beams, continuous slabs systems). FEM calculation of internal forces and deformations of RC slabs. Calculation of slabs loaded by concentrated forces. Force distribution around openings. Punching of flat slabs. Calculation of stairs. The basics of plasticity theory, calculation of collapse load in case of slabs. Reinforcement of concrete slabs, reinforcement drawing - 4.
8.	Load bearing and typical internal forces of RC slabs. Approximate slab calculation methods (strip method, Menyhárd method, calculation of flat slabs using the method of equivalent beams, continuous slabs systems). FEM calculation of internal forces and deformations of RC slabs. Calculation of slabs loaded by concentrated forces. Force distribution around openings. Punching of flat slabs. Calculation of stairs. The basics of plasticity theory, calculation of collapse load in case of slabs. Reinforcement of concrete slabs, reinforcement drawing - 5.
9.	Configuration, materials and dimensioning of non-reinforced and reinforced masonry walls. Verification of masonry walls subjected to eccentric compression and shear - 1.
10.	Configuration, materials and dimensioning of non-reinforced and reinforced masonry walls. Verification of masonry walls subjected to eccentric compression and shear - 2.
11.	RC structural details: corbel, strut and tie model, introduction of forces, local compression, helical reinforcement - 1.
12.	RC structural details: corbel, strut and tie model, introduction of forces, local compression, helical reinforcement - 2.
13.	RC structural details: corbel, strut and tie model, introduction of forces, local compression, helical reinforcement - 3.

14.	Foundations, statically indeterminate bracing systems, consultation.

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

2.5 Tanulástámogató anyagok

a) Textbooks:

1. György Deák, András Draskóczy, Endre Dulácska, László Kollár, György Visnovitz: *Reinforced Concrete Design Aids*, Dept. of Mechanics, Materials and Structures, Faculty of Architecture, 2011. (compulsory)
2. Phil M. Ferguson, John E. Breen, James O. Jirsa: *Reinforced Concrete Fundamentals*, Wiley, April 1988. (recommended)

b) Online materials:

1. Reinforced concrete design aid – Supplement to the 2011 edition, Electronic Lecture Note.
2. Reinforced concrete frames, Electronic Lecture Note.
3. Reinforcement of concrete frames, Electronic Lecture Note.
4. Bracing systems, Electronic Lecture Note.
5. Reinforcemed concrete slabs, Electronic Lecture Note.
6. Masonry Structures Lecture Notes.
7. Basis of the design of masonry structures according to EC, Electronic Lecture Note.
8. Masonry structures design aid to be used on the Test, Electronic Lecture Note.
9. Reinforced concrete detailing, Electronic Lecture Note.

2.6 Egyéb tudnivalók

2.7 Konzultációs lehetőségek

The instructors are available for consultation during their office hours, as advertised on the department website.

Jelen TAD az alábbi félévre érvényes:

Inactive courses

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via three midterm exams, three active consultations and two drawing homeworks.

3.2 Teljesítményértékelési módszerek

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm test	ZH1	A.1-A.2; B.1-B.2; C.4; D.1
2. midterm test	ZH2	A.3-A.4; B.3-B.4; C.4; D.1
3. midterm test	ZH3	A.3, A.5-A.6; B.3, B.5-B.6; C.4; D.1
1. active consultation	AC1	A.1-A.2; B.1-B.2; C.1-C.5; D.1-D.3
2. active consultation	AC2	A.3-A.4; B.3-B.4; C.1-C.5; D.1-D.3
3. active consultation	AC3	A.3, A.5-A.6; B.3, B.5-B.6; C.1-C.5; D.1-D.3
1. drawing homework	HW1	A.1-A.2; B.1-B.2; C.1-C.5; D.1-D.3
2. drawing homework	HW2	A.3-A.4; B.3-B.4; C.1-C.5; D.1-D.3

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

3.3 Teljesítményértékelések részaránya a minősítésben

Abbreviation	Score
ZH1	32,5%
ZH2	32,5%
ZH3	32,5%
AC1	5%
AC2	5%
AC3	5%
HW1	10%
HW2	10%
Total achievable during the semester	100%
Sum	**100%**

The test is not successful if the average of two better tests is less than 50% of the available points (32,5 points), or if the average of two better results of theoretical part of the tests is less than 40% of the points available with the theoretical part.

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

No signature can be obtained from the subject.

3.5 Érdemjegy megállapítása

The marks for those who meet the attendance criteria will be determined according to the following aspects:

The final mark will be calculated on the basis of the weighted average of the two best midterm exams, the performance on the 3 active consultations and the 2 drawing homeworks as described in point 3.3.

The maximum score for each of the midterm exams is 65 points. Additional points can be obtained by writing the third (weakest) final examination with a score of ≥50%. The extra point is 10% of the score of the weakest (but successful) midterm exam (max. 7 points).

3 active consultations are worth a maximum of 5+5+5 points. Technical details on how to conduct the active consultation are given in the guidelines issued at the beginning of the semester.

The 2 drawing assignments submitted by the deadline are worth a maximum of 10+10 points. Drawings must be

consulted at least once before submission and must be submitted digitally. Further details on submission are given in the homework assignment.

A total of 100 points (107 points including extra points) can be achieved during the semester. The final grade based on the points:

Grade	**Points (P)**
excellent (5)	90<=P
good (4)	75<=P<90%
satisfactory (3)	60<=P<75%
passed (2)	45<=P<60%
failed (1)	P<45%

3.6 Javítás és pótlás

There is no minimum requirement for individual mid-term benchmarking, therefore individual retake of the tests is not possible.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	**Hours/semester**
contact hours	14×3=42
preparation for the tests	14+14+14=42
active consultation and homework	36
Sum	**120**

3.8 A tárgykövetelmények érvényessége

2024. szeptember 1.

Jelen TAD az alábbi félévre érvényes:

Inactive courses